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Harvesting, Drying, Processing, and Storing Seed in Hot and Humid Climates

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CONTENTS

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Seed longevity is strongly influenced by temperature and relative humidity, with deterioration accelerated in hot, humid climates. This publication outlines practical, low-cost methods for small-scale farmers to harvest, dry, and store vegetable, herb, and flower seeds under such challenging conditions. It describes crop-specific approaches for wet- and dry-seeded crops, emphasizing proper harvest timing, cleaning, and processing to achieve seed moisture contents of 3–8%. Techniques evaluated include fermentation for tomato seed cleaning, primary and secondary drying, and the use of silica or zeolite desiccants, low-cost dehydrators, and airflow-based systems. Storage strategies are presented with reference to Harrington's Rule of 100, highlighting the critical role of moisture reduction over temperature control, and offering guidance on when refrigeration or freezing is beneficial versus when stable ambient storage is sufficient. By applying these methods, farmers can protect seed vigor, maintain genetic integrity, and extend seed shelf life, ensuring more reliable crop establishment across seasons.

Photo: USDA

Introduction

This publication is for small-scale farmers who are interested in practical and effective seed harvesting, drying, and storage practices that will prolong the shelf life and quality of seeds, and pertains specifically to common vegetable, herb, and flower seeds grown on farms and in gardens that keep well in storage conditions.

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Whether seeds are purchased or saved, protection is worthwhile to prevent spoilage. A storage environment that is dry, dark, stable, and cool is ideal, but subtropical climates are the opposite—humid, bright, and hot! Under ideal storage conditions, many crop seeds can last for several years. Ultimately, the best practice to preserve seeds is to regularly plant and share them, but there will always be times when farmers, especially those saving their own seeds or storing bulk amounts of purchased seeds, will need storage options. This publication provides practical information and inexpensive solutions for farmers to protect their most precious resource—seeds!

Optimal conditions may not be achievable for some farmers and may not even be necessary if seeds are being used within a short period of time. Adopting proper storage practices is essential to protect the time and money invested in growing and harvesting seeds intended for use over many seasons. Any efforts to improve storage quality will help with seedling vigor, even if storage is only for a short period of time. This publication covers how and when to harvest various types of crop seeds, primary drying of unprocessed bulk seeds, secondary drying after seed cleaning, materials and equipment, and storage.

Seed Harvesting Basics

Seeds are harvested based on how they are held on the plant. Some crops are wet-seeded and others dry-seeded. Crops in the wet-seeded category contain seeds inside fleshy fruit that need to be removed, washed, and dried. Crops in the dry-seeded category contain dry seeds inside pods, or fully exposed "naked" seeds that include many flowers and herbs and grain crops like sorghum and corn. Each crop is unique in its optimal seed harvest time and special techniques that work best for extraction, threshing, and winnowing. Simple seed cleaning equipment is helpful for processing and cleaning seeds, can be very inexpensive, and may already be available on the farm. Supplies and equipment are described in this publication.

Wet-Seeded Crops

This group has seeds contained inside fleshy fruit, and includes crops such as tomatoes, peppers, eggplant, and most cucurbits like winter squash, summer squash, cucumbers, and melons. The fruit's protective skin makes them less vulnerable to spoilage compared to dry-seeded crops, but timing of harvest and seed cleaning is still important. Farmers grow many wet-seeded crops to full seed maturity

stage, so no additional work or growing time is needed, other than seed processing and some pre-planting planning if cross-pollination of the crop is a concern. Exceptions include eggplant, cucumber, and summer squash that must grow for a longer period of time, since the seeds at the crop's market maturity are underdeveloped and not viable. Seed maturity comes many days or weeks later, as the fruit becomes inedible and past the stage at which they would be harvested for market. Each crop is unique, and getting to know the crop's indicators of seed maturity will get easier with time and experience. Guidelines in Table 1 provide seed maturity indicators and processing techniques as a starting place.

Farmers saving their own seeds will need to process and dry them as quickly as possible. Once wet-seeded crops are extracted from the fruit, they must be rinsed and washed with cool water as best as possible to separate them from the surrounding material. Lay them out in a single layer on fabric napkins or towels, fine mesh screen, paper plates, or coffee filters. Regular paper, newsprint, and paper towels stick to seeds and are not advised. Every day, mix the seeds around to pull them off the material as they are drying to prevent sticking. Tomatoes can be gently rubbed between the fingers or palms to separate the seeds.

Crops such as tomatoes, peppers, winter squash, and melons all contain mature seeds at market maturity. All that's needed is to separate, wash, and dry the seeds from the fruit. Photo: Melissa DeSa, Working Food

Crops such as eggplant, summer squash, and cucumber do not contain mature seeds inside at market maturity. They must be left on the plant for several more days or weeks, long past the edible stage. They grow larger, and turn a yellow-brown color depending on the crop and variety. Photo: Melissa DeSa, Working Food

Tomatoes are one crop that should have their seeds fermented as part of the cleaning process. This process removes the gelatinous sac around each seed, which contains germination inhibitors, and results in a nice clean seed.

Fermenting Tomato Seeds Prior to Drying

Tomatoes are one crop that should have their seeds fermented as part of the cleaning process. This process removes the gelatinous sac around each seed, which contains germination inhibitors, and results in a nice clean seed. It's been suggested that fermentation also reduces disease, but the diseases impacted are limited and the process must be done with specific temperature and timing to be effective. Thus, fermentation shouldn't be depended on as a means to destroy pathogens (Navazio, 2012).

To ferment, leave the container of tomato mash achieved from squeezing or mashing fruits to sit with a cloth over the top to reduce smells and discourage fruit flies. The mixture can be stirred daily, although some seed savers do not stir so that they can observe the state of fermentation by looking at the top layer of film. Sometimes seeds get trapped in the upper layer of material, and mixing can release them to the bottom.

Ideal temperatures are between 70°F and 85°F (Buttala and Siegel, 2015), and the process should be complete in less than three days. If conditions are hot and humid, three days or more may cause damage to the seed. The good seeds separated from their gel sac will sink to the bottom, while non-viable seed and the sacs float to the top. When this happens and mold appears, the mixture can be decanted and repeated a few times until clean water and clean seeds are obtained. Strain the clean seeds over a fine sieve or colander, then lay them in a single layer to dry on fabric, screens, or coffee filters.

The sequence of tomato seed fermentation. 1: Tomato mash left to sit begins fermenting naturally. 2: After 24-48 hours, seeds are decanted and rinsed a few times, good seeds sink to the bottom. 3: Seeds are strained and rinsed once more over a colander. 4: Seeds left to dry in a thin layer on a coffee filter. Spreading with the back of a spoon helps spread them out without sticking to fingers. 5: Move seeds around on the filter, rubbing between fingers and separating more as they more fully dry. Photo: Melissa DeSa, Working Food

Table 1: Seed harvesting guidelines for common wet-seed crops. Source: Melissa DeSa, Working Food

CROP	MARKET MATURE = SEED MATURE	HARVEST NOTES
Cucumber	No	About 6 weeks maturation beyond market mature cucumbers. Wait for larger, yellowish fruits to develop. If unsure, cut one open to inspect the seed. If they are firm and filled out, looking like cucumber seed for planting, they are ready. Cut open, scoop out seeds and the juice, and ferment for a day or less. Good seed will sink to the bottom, sometimes good seed rises to the top, so don't discard them all if they look good. Decant, rinse, and repeat until the seeds are clean, and lay out to dry. It is not necessary to ferment, and doing so for too long can be harmful to seed.
Eggplant	No	About 4 or 5 weeks maturation beyond market mature eggplants. Wait for larger, brown/yellow fruits to develop. Harvested fruit can be left a few days longer before processing but do not wait longer as they may rot. Cut open and extract the seed. Large amounts can be frustrating because seeds are tightly lodged in the abundant flesh. Tear into many small chunks and squeeze/mash repeatedly with water until seeds release and can be separated with a colander or mesh screen from flesh. A food processor with a plastic dough blade and some additional water helps break up chunks and separate seeds. Separate seeds from pulp with a colander, rinse, and repeat until the seeds are clean, and lay out to dry.
Melons	Yes	Fully mature and edible cantaloupes and watermelons contain mature seeds. Simply scrape out, rinse really well, and dry. Fermentation is not necessary, but if done can be helpful to clean seed really well of the placental material. But it should not be done for too long (24 hours or less) otherwise the germination can be affected and the seed damaged. Similar to cucumbers, good seeds are likely to sink, but sometimes good seeds also float so inspect them closely before pouring off.
Peppers	Yes	Fully mature and edible stage peppers contain viable seed but never when they are still green and immature. Allow to fully develop until their final color. Simply cut open, scrape out, rinse, and dry. If any seed cavities are moldy, even if the outside looks great, it is not advisable to save those seeds.
Squash, Summer	No	About 6-8 weeks maturation beyond market mature summer squash. Wait for very large sized fruit with tough rinds that have undergone a color change from immature edible fruit. Holding for about 20 days post harvest can help with seed quality improvement. Simply scrape out, rinse, separate seeds from pulp with ¼ inch screen/ hardware cloth and spray with a high pressure water. Fermenting is not necessary.
Squash, Winter	Yes	Fully mature and edible stage winter squash contain viable seed. Ideally harvested when stems turn brown and rind hardens, resisting indentation with a fingernail. Proper curing and storage improve flesh/eating quality and seed. Simply scrape out, rinse, separate seeds from pulp with ¼ inch screen/hardware cloth and spray with high pressure water. Fermenting is not necessary.
Tomatoes	Yes	Fully mature and edible tomatoes contain viable seed. Squeeze tomatoes and their juice into a jar and ferment for 1-2 days until mold forms, and seeds sink to bottom. Decant and rinse several times until clean, strain and dry. It will get stinky, so covering with a cloth to reduce odors and prevent fruit flies is advised.

Dry-Seeded Crops

This group of seeds include crops such as legumes (peas, beans, cowpeas, etc.), brassicas (kale, collards, mustards, Asian greens, etc.), amaranth, okra, lettuce, flowers, herbs, and dried cucurbits like gourds and luffa. More time is needed for these crops to develop fully mature seed, which is long past the stage of edible market maturity. This is a major limitation in some farming systems. A leafy green may take 40-60 days to harvest for market, but 120-180 for seed harvest. Another consideration is that increased spacing is needed for Brassicas and lettuce plants that grow substantially larger as they fully mature (compared to their market harvest size), to increase airflow. Staking keeps them upright and off the ground, protecting seeds from rot and trampling. Some crops may be self-supporting and not need staking; you can wait and see or be proactive and set up a simple support system before plants get so big and unwieldy that it's hard to prop them up late in the growing process.

This extra time requires continued crop management, and longer times in the field can lead to increased chances of pests and disease. It's also time that could be used for another higher value crop. So, the tradeoffs will need to be considered for your farm's situation.

As with all seed harvesting, the indicators of seed maturity vary by crop and variety, and the best knowledge is gained by experience with the crop. Guidelines in Table 2 provide seed maturity indicators and processing techniques as a starting place. Many crops that are easy to grow for market are tricky for producing seed. They take longer to mature and are much more vulnerable to

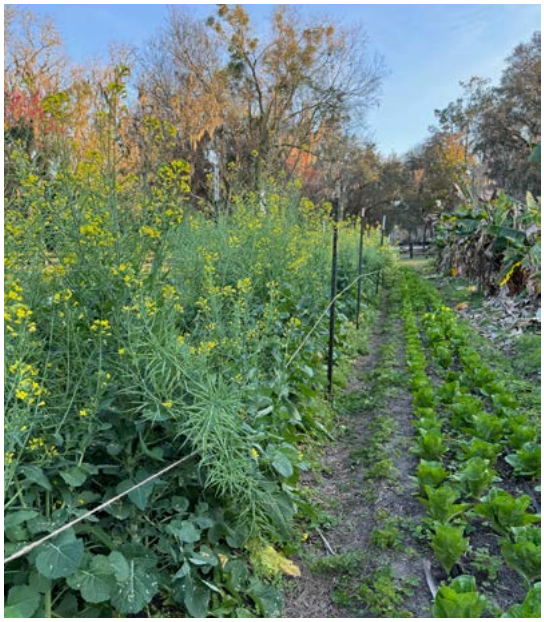
Examples of dry-seed crops include: legumes like Conch peas and Dixie butterbeans, marigold flowers, brassicas like Asian mustard Maruba Santo, amaranth, okra, lettuce, dill, and luffa. Photos: Melissa DeSa, Working Food

loss due to high humidity and moisture. For example, cowpeas *(Vigna unguiculata)* are a commonly grown crop in the southeast for fresh peas or as a cover crop. Obtaining mature, dry seed is possible, but the time in which the crop is entering its final seed development stage is vulnerable to high moisture and the seed crop can easily be ruined. If it also coincides with the pesky cowpea weevil, a significant portion of the seed crop may be lost, especially if it is not harvested promptly and dried quickly. Farmers need to find the best timing based on their local growing conditions.

Crop and Seed Types Influence Storage Tolerance

Not all crops are equal in their tolerance to drying and storage. For example, the seeds of some tropical fruits such as mango, avocado, and jackfruit cannot tolerate drying or storage and will die if not planted promptly. In their natural growing environment, it is more advantageous for the seed to grow immediately upon dropping to the ground, otherwise they risk predation or decay. Typical farm and garden crop varieties are generally more resistant to desiccation and are adapted for storage; however, their longevity varies depending on factors like seed coat thickness and oil content.

Since dry-seeded crops are more vulnerable to environmental humidity, farmers must be proactive at harvest time to stay ahead of inclement weather, and to prevent loss of seeds that may readily shatter, scatter, or blow away. Seeds contained in pods are much easier to shell if they are fully dried. If



Ethiopian kale *(Brassica carinata)* is harvested for market in 50 days but can take 120 days to seed maturity. Not only is more time needed, but each plant gets much larger and may require staking to keep tall flowering stalks upright, and some management to thin the plants to increase air flow. Pests like aphids and flea beetles are possible and will need to be managed. Photo: Melissa DeSa, Working Food

Additional time in the field for brassica seed pods can lead to an outbreak of aphids, which seem to love young seed pods. Aphids multiply quickly and their feeding damage can deform pods and possibly introduce disease. They will need to be managed. Ladybugs often appear as seen here along with their more predaceous larval stage. Photo: Melissa DeSa, Working Food

Weevils can devastate a Vigna crop like cowpeas and yard long beans. Harvest and storage practices can help mitigate the problem. Photo: Melissa DeSa, Working Food

Failure to harvest seeds on time, and unavoidable long rainy events can lead to seed loss. Zinnias near full seed maturity exposed to constant moisture can sprout right on the plant! Photo: Melissa DeSa, Working Food

Table 2: Seed harvesting guidelines for common dry-seed crops. Source: Melissa DeSa, Working Food

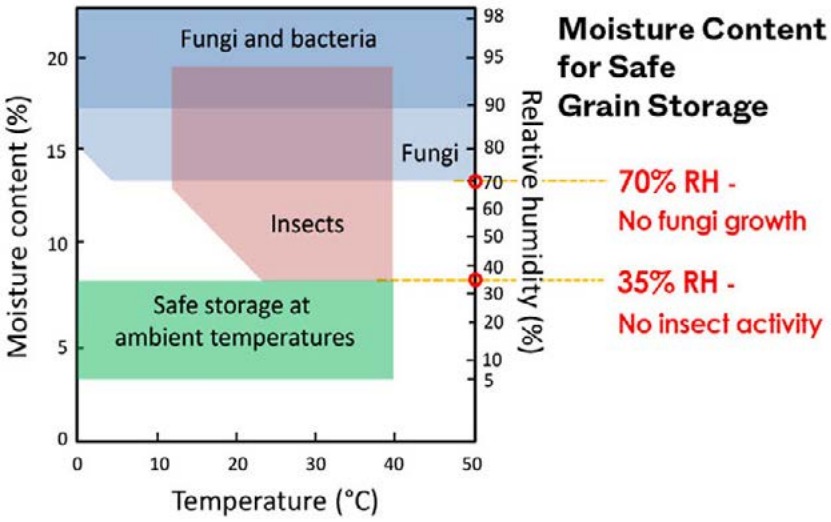
CROP	MARKET MATURE = SEED MATURE	HARVEST NOTES
Amaranth	Depends: Dried seed if used as food in some varieties vs. leaf	Abundant tiny seeds are embedded within the small flower structures. As flowers wither and die back, starting from the bottom, seeds can be hand harvested by rubbing vigorously into a bucket. Or when flowers are ⅔ ready, clip the entire flower head and dry indoors. Be careful of potential weediness with abundant seeds that are likely to fall to soil.
Brassicas	No	Pods form on tall stalks after flowering, ripening from the bottom up and staggered in time with simultaneous flowering and seed pod production. Seeds will easily shatter in the field if harvested when very dry, but harvesting too early will result in immature seed. Timely harvesting is critical to find the perfect state when pods are yellow-tan color. Entire stalks near final maturity can be harvested and dried indoors even if the top several pods are still green and immature. They will rarely all be uniformly ripened and it's best to save most of the good seed and lose the smaller, younger ones.
Corn and Sorghum	Depends: Dried seed may be used as food in some varieties	Seeds are ready when fully dried, indicators vary depending on variety. Corn ear silks turn brown and in some varieties the ear drops and hangs, husks turn brown, seeds are hard. If harvested early to avoid moisture, husk immediately and dry indoors. When the seed is sufficiently hard, shell from the cob. Sorghum maturity varies greatly by variety, but are best harvested when seeds are dry and resist denting when pressed with a fingernail - approximately 50 days after pollination. Loose open panicles dry easier in the field compared to more dense ones.
Flowers and Herbs	No	Seeds are very exposed without protective pods or fruit structures, and must be harvested in a timely manner. The vast diversity is hard to generalize, but ornamental garden flowers bear seeds in the central disk after the flowers die back. Herbs may have small seeds inside papery husks, or exposed seed. Monitor seed maturity and weather conditions carefully, and harvest stems or entire plants early if necessary to dry indoors. Hand harvesting from the plant in dry conditions is ideal but not always possible.
Legumes	Depends: Dried beans or peas may be used for food.	Fresh green pods change color and texture depending on variety, to a leathery yellow, mahogany or buckskin color. When completely dry they can be harvested off the plant by hand. If handling large volumes of seed, cut plants at soil level and bring indoors to dry when ⅔ are ready with matured or nearly matured seed.
Lettuce	No	Abundant small seeds attached to feathery parachute-like structures (pappus) can easily disperse in the wind if not harvested on time. When about ⅔ in the feathery stage, the entire stalk can be harvested and dried further indoors. If only harvesting enough for on-farm use, hand harvesting from the plant as they are ready may yield enough, as each lettuce plant produces a lot of seed. Seed maturity is indeterminate thus there is always a chance of losing some of the seed crop. Stems have milky sap that is sticky and may irritate skin.
Okra	No	Pods enlarge and turn yellow/tan and become dry and nearly like wood, as seeds mature. Some varieties will split at the seams, indicating they are ready even if not fully dried. The large pod is very protective of the seeds inside, and seeds rarely drop or mold, so there is time to spare - but left too long they will mold and become ruined. Clip from the plant and bring indoors to dry.

ambient harvest conditions are not conducive to drying, they should be brought indoors to fully dry. Once seeds are removed from their pods, simple winnowing with fans or wind and sifting with screens can be used to separate more chaff from the seeds. It is important to remove pods, shells, and chaff as soon as possible as they may harbor insect eggs, pathogens, and moisture. In hot and humid climates, seeds should not be dried in the sun when temperatures exceed 95°F (McCormack, 2004). Instead, the preferred situation is a climate-controlled space or one with fans and good air circulation. Seeds should be processed, cleaned, and dried as quickly as possible to reduce incidence of moisture, mold, insect growth, and other undesirable impacts on seed quality.

Humidity is the number one killer of seed longevity.
A seed's longevity is reduced by approximately half for every 1% increase in seed moisture content.

Optimal Conditions for Seed Storage and Longevity

Seeds are living plants and should be treated thoughtfully to preserve longevity and quality. Although in a semi-dormant state, seeds are responsive to environmental cues for growth including warmth, light, and moisture. These cues must be removed for seeds to remain in dormancy and replaced with cool, dark, dry, and stable conditions. Of these, the most critical and hardest to achieve in hot and humid climates is dryness.



How temperature and moisture content of seeds affect the environment of storage conditions. Source: drychain.org

Depending on the season, ambient conditions range from 50-100% relative humidity throughout the year. Ideally, seeds should be stored in conditions with relative humidity of 35% or less. There are low tech and inexpensive options to achieve this, even in humid climates.

Producers often assume that cold conditions are needed for seed storage. While this is certainly helpful in prolonging the life of a seed, cold storage is not as important as moisture content and cold storage should not be used if seeds are not fully dry. Home refrigerators and walk-in coolers are typically high in humidity, and therefore not ideal for storage. For example, a walk-in cooler for food storage typically maintains 95% relative humidity, while the freezer ranges between 80-90% relative humidity. With frequent use (people in and out, doors open and closed, defrost cycles, etc.), the conditions change constantly, which is also detrimental to seed quality. It is preferable to maintain stable conditions for fully dried seeds in an airtight container in ambient indoor room conditions. A desk drawer, closet, or other space in the home or office will suffice. Refrigeration and freezing are not necessary, especially if short-term storage is the goal (i.e., months to a few years).

Low seed moisture content is not only more affordable and energy efficient than cold storage, but more effective in terms of seed longevity. Source: drychain.org

Final Drying of Cleaned and Processed Seeds Prior to Storage

Once seeds have been removed from their fruits and pods and basic winnowing or cleaning is completed, they may still need additional drying before going into storage. The volume of seed, crop type, and resources available will determine the technique used. Below are some practical and accessible tools and supplies for low tech seed drying at a small to medium scale.

Drying Beads

Silica beads or ceramic zeolite beads, such as Drying Beads®, are excellent for drawing moisture out of seeds and can be reused many times. Silica beads change color, indicating when they are fully dry. Zeolite beads, however, do not change color as their saturation capacity changes, so knowing when to refresh them is more challenging compared to silica. Both types of beads work well to draw moisture out of seeds without creating heat. Zeolite beads are estimated to be available for regeneration a minimum of 10,000 times (USAID), whereas silica loses water holding capacity with each regeneration cycle. Either option will work for most small-scale growers and seed collectors. Zeolite beads are also safe to use for food storage, so any dried fruits and herbs processed on the farm, or for personal use, can benefit from these beads.

Seed oil content, temperature, and initial moisture-wicking capacity influence the quantity of beads needed to dry seeds. The best approach is to use a 0.5:1 to 1:1 ratio of beads to seeds. Once beads are added, monitor the moisture content using estimates of the air's relative humidity with an inexpensive hygrometer and/or humidity indicator tape. When sufficient moisture levels in the seeds are obtained, remove the beads, and seal the container. You may need to recharge beads if seeds need more drying and the measured relative humidity inside the container is not changing (Osmani, 2023). The lower the relative humidity the better, but a general recommendation is to store crop seeds under 35% humidity. Table 3 provides guidelines for crop seed moisture content based on measured relative humidity in storage conditions.

Racks with screen bottoms allow bulk seed material to lay out and dry. Box fans increase air flow and help drying. Photo: Melissa DeSa, Working Food

Dehydrators

Home scale food dehydrators can be used to dry larger seeds. As a rule, seeds should not be exposed to temperatures over 100°F to prevent damage to the living embryo (Motis, 2010). Stop drying as soon as possible to avoid prolonged exposure to heat. DIY larger size dehydrators that generate heat with incandescent light bulbs and airflow with fans can also be built. Refer to the ECHO seed saving publication in the Further Resources section for guidance.

Drying Rack

Simple racks of screens can be repurposed from old windows or custom built and fitted with box fans to keep air moving over the seeds. Cabinets can also be modified by adding fans. While these are great for drying various types and volumes of seed, they will not fully dry seeds in humid environments without air conditioning, like

a barn. In these instances, piles of seed may need to be rotated frequently. In our experience, using these in an un-air-conditioned barn, drying rack setups are sufficient to remove enough moisture to make the next step of seed processing more efficient, as some types of crops with seeds in pods can be very difficult to process when not fully dried (i.e. beans, peas, and brassicas).

Drying Closet

If a small closet or other enclosed space is available that has access to power, a temporary drying closet can be set up. Ideally the closet is insulated with foam panels with door cracks sealed to prevent air leakage. Place wire shelving, a small dehumidifier, and a small circulating fan in the closet. The temperature increase will assist with drying in addition to the dehumidified conditions. Inexpensive materials can be purchased at home improvement stores for all these materials. Electricity costs are minimal and the set up may only be a few hundred dollars.

Working Food and Florida Wildflower Cooperatives' Seed Drying and Storage Room

Farmers with large quantities of seed and available, dedicated storage space can build a seed drying room. The seed drying and storage room used by Working Food in Gainesville, Florida, is modeled after the one built at The Florida Wildflower Cooperative, designed to provide high quality storage conditions for medium to short term use (less than 10 years storage). A 10x10 foot walk in cooler with insulated panels is sealed to prevent temperature and moisture fluctuations. The environment is kept fairly stable throughout the year at 72°F using a window air conditioning unit that vents to the outside. Relative humidity is kept under 35%, often dipping lower during cooler and drier months. This is accomplished with a dehumidifier that runs continuously with a hose draining outside the building. The two home appliances, purchased at home hardware stores, run continuously and are sufficient for the purposes of a community seed bank that keeps seeds in storage for 1-10 years. All cracks and holes are sealed, and lights are kept off except when in use. While the energy cost will vary by utility, this unit uses an estimated 1,100 watts and costs approximately $1,000 annually to operate. This space can also be used to dry leaves of herbs, medicinal plants, and flowers. We have found excellent germination rates on seeds more than seven years old in conditions that, while not perfect, are both attainable and affordable. Most farmers are likely keeping seeds for a shorter period than this, unless they are storing bulk amounts of seed for long term use.

A walk-in cooler (left) turned into a dry room for storing and drying out seeds (right). Photo: Melissa DeSa, Working Food

Table 3: Moisture content approximations of some common crop seeds at 77°F (25°C).

A reading of relative humidity (RH) is easily achieved with a hygrometer. Ideally, seed moisture content should be between 3-8% (IBPGR Handbook 1985). Seeds not listed may be estimated based on their closest related crop. Modified from Rao et al. (2006).

CROP	RELATIVE HUMIDITY (%)							
	10	15	20	30	45	60	75	90
Oily Seeds. Ideal 3-8% seed moisture content.								
Cabbage	2.9	-	4.6	5.4	6.4	7.6	9.6	-
Mustard	1.8	-	3.2	4.6	6.3	7.8	9.4	-
Radish	2.6	-	3.8	5.1	6.8	8.3	10.2	-
Eggplant	3.1	-	4.9	6.3	8.0	9.8	11.9	-
Groundnut	3.0	-	3.9	4.2	5.6	-	9.8	13.0
Okra	3.8	-	7.2	8.3	10.0	11.2	13.1	-
Soya bean	4.1	-	5.5	6.5	7.4	9.3	13.1	18.8
Turnip	2.6	-	4.0	5.1	6.3	7.4	9.0	-
Non-Oily Seeds. Ideal 7-11% seed moisture content.								
Bean, Lima	4.6	-	6.6	7.7	9.2	11.0	13.8	-
Beet	2.1	-	4.0	5.8	7.7	9.4	11.2	-
Buckwheat	-	6.7	-	9.1	10.8	12.7	15.0	19.1
Carrot	4.5	-	5.9	6.8	7.9	9.2	11.6	-
Cucumber	2.6	-	4.3	5.6	7.1	8.4	10.1	-
Lettuce	2.8	-	4.2	5.1	5.9	7.1	9.6	-
Maize (corn)	3.8	-	5.8	8.4	10.2	12.7	14.4	18.8
Oat	-	5.7	-	8.0	9.6	11.8	13.8	18.5
Pea	5.4	-	7.3	8.6	10.1	11.9	15.0	-
Rice	4.6	5.6	6.5	7.9	9.8	11.8	14.0	17.6
Sorghum	-	6.4	-	8.6	10.5	12.0	15.2	18.8
Squash	3.0	-	4.3	5.6	7.4	9.0	10.8	-
Tomato	3.2	-	5.0	6.3	7.8	9.2	11.1	-
Watermelon	3.0	-	4.8	6.1	7.6	8.8	9.0	-

When is the Seed Dry Enough?

In large-scale seed systems, high tech seed moisture readers are used to assess the moisture content of seeds. Alternatively, moisture levels can be determined by comparing the fresh weight to the dried weight. Moisture readers may not be easily accessible to the typical small-scale farmer and are not generally necessary. Smaller scale growers may use some crude but effective ways to test seed moisture content; specifically, the bite, smash, or snap tests (see below for more detail). Another simple method is to use the accompanying chart (Table 3) to estimate the seed moisture content based on crop type and relative humidity.

For larger seeds, such as pumpkin seeds that can be held with fingers or small pliers, dryness can be tested by attempting to snap the seed in half. If the seeds break cleanly, they are sufficiently dry; however, if they bend or do not cleanly snap, they require further drying. Similarly, seeds like corn or beans can be tested by striking them with a hammer on a hard surface—if they shatter, they are dry, but if they flatten or "smoosh," they still contain too much moisture and need additional drying. Another method is to lightly bite the seed; if bite marks are left, the seed is too moist and should be dried further until it resists indentation.

Smaller scale growers may use some crude but effective ways to test seed moisture content; specifically, the bite, smash, or snap tests.

Seed Processing Equipment

Farmers have found many ways to process seeds, and it takes practice and some ingenuity to make simple equipment that helps the process be more efficient. Stomping, driving over seeds, stirring in a bucket with chains or sticks, and whacking back and forth in a container are all easy things to do using equipment likely already on a farm, or with inexpensive hardware and DIY contraptions. If a farm increases the volume of seed being processed, it may require more specific machinery, such as threshers and hoppers, to efficiently process the seed.

Dry seed pods cut from Ethiopian kale plants are stomped on over a tarp. If seeds are really dry, most will easily release from their pods. By adjusting the tarp, small seeds will remain on the bottom and the bulk of other plant material can be grabbed by the armful and removed. Pouring over a screen of the right size and then winnowing in front of a fan will likely be the most a farmer would need to do to get seeds clean enough. Photo: Melissa DeSa, Working Food

Once seeds are mostly separated, they can be further cleaned and sorted to remove unwanted material and poor quality seed—the extent to which depends on the farmer's goals. If seed is mostly for personal use, simple cleaning and adequate drying before storage will suffice. If they are to be sold or shared more widely, a more thorough cleaning of the seed may be necessary, and having the right tools is helpful.

Most farms already have equipment that will be helpful for seed harvesting and processing like buckets, bins, tarps, and box fans. Additional seed processing equipment is helpful as farmers begin to grow and harvest more of their own seed, making the work easier and more effective. It is one of the most satisfying things—to take a pile of brown plant material and winnow it down in subsequent steps, into a bucket of clean seed!

Cowpeas threshed and removed from pods by first stomping or whacking with stick, are then dropped from high up multiple times to allow light weight debris to blow away. This works best on windy days or with a fan. Photo: Melissa DeSa, Working Food

Mesh bags help with seed drying and air flow. Ideally this is done in a climate controlled space, but at a minimum, in a covered area with adequate air flow and fans. These sacks are holding garlic but could also hold dry seeds and pods. Photo: Melissa DeSa, Working Food

Screening the seeds to isolate them from plant material and debris can be easily added to your process, saving a significant amount of time. Start with a handmade wood frame with hardware cloth or window screen. Screens of different sizes exist for nearly every crop, and the more specific the screen, the more it will improve your seed cleaning process. For large scale seed farms, seed cleaning equipment like a Clipper Tester and Cleaner that mechanize the process can be added to your production.

Mesh bags are great for holding pods of all sorts, allowing airflow if they are hung to dry in the right place, or placed on wire racks. Be sure the mesh size is adequate to hold in the plant material. Many farms already have mesh produce bags for potatoes and carrots that can be used.

DIY seed vacuum aspirators can be built using free online design plans like this one from Real Seeds and work well to separate small undeveloped seeds and any last remaining chaff after the first separation. Many small-scale seed growers have one. They take up little space, are very effective, and often good enough for a final cleaning and separation of seed.

Tools such as the Winnow Wizard are great for fine-tuned seed cleaning. These remove

Simple screens can be made and can also be purchased in every possible size for specific seed types. Photo: Melissa DeSa, Working Food.

A Winnow Wizard is a specialized and hand-built seed cleaning piece of equipment that is used for the final stage of cleaning. This is the final step to producing high quality and cleaned seed that will increase germination percentage of a seed lot by removing poor quality seeds that are hard to remove any other way. Photo: Markael Luterra

immature seeds, dirt, sand, and other unwanted material that other methods can't fully remove. These are only worthwhile for farmers processing bigger volumes of seed, and who are selling seeds and want to get them as professionally polished as possible. Sharing a Winnow Wizard with other nearby growers would be a more affordable and effective way to access this machinery.

Storage

Canning jars or other jars and containers with a tight-fitting rubber gasket type seal are inexpensive and effective at keeping moisture and air out. Packets or bags of seeds can be placed inside the containers. Storing seeds in open, breathable paper or mesh bags is insufficient for good seed storage. Plastic bags are not sufficient as they have a porous nature, unreliable zipper closure, and cannot effectively keep air and moisture out. Filling up containers as full as possible is a good strategy to remove available oxygen from the seed, which reduces the incidence of insect pests like weevils (Dareus, 2021).

Important considerations for vacuum sealing are the volume of seed, sufficiently low seed moisture content prior to sealing, and the frequency with which the sealed container will be opened.

Vacuum Sealing

For longer term seed storage conditions, vacuum sealing is an excellent, easy option. Humidity is kept out of the sealed container, and it reduces oxygen levels, which has been shown to extend the life of seeds and reduce the survival of insect pests like weevils (Motis, 2019). Inexpensive home-scale food vacuum sealers can be used to seal plastic bags, and attachments work to seal canning jars.

Important considerations for vacuum sealing are the volume of seed, sufficiently low seed moisture content prior to sealing, and the frequency with which the sealed container will be opened. Large volumes of seed should be divided and sealed in smaller quantities, since having too many seeds in a container or package may generate excess heat or moisture as they respire. Seeds should be dried to as low a moisture content as possible, to about eight percent, before sealing (see Table 3 for how to determine seed moisture content based on relative humidity). If the container is opened frequently, then vacuum sealing is not a good solution. Consider vacuum sealing only the seeds that will be stored for a long period of time.

A sample of vacuum sealed roselle seeds. Photo: Melissa DeSa, Working Food

Storage Conditions

Once seeds are adequately cleaned, dried, and put into suitable containers, it's time to get them into the most optimal storage conditions available. Seed storage conditions should ideally be dry, dark, stable, and cool. If seeds are dried to the furthest extent possible and are placed in an airtight container, then any location in a climate-controlled space that is out of the way and not frequently disturbed is sufficient (i.e., a dark closet, under a bed, or in a dresser drawer). Freezing will prolong the life of seeds even more but must only be used if seeds are fully dried. Seeds not fully dried risk being killed if ice crystals form and rupture cells. Further considerations are the frequency of use of the freezer. If it is opened regularly, this reduces the stable conditions as humidity, temperature, and light are changed each time the door opens. The same logic applies to home refrigerators that are frequently accessed and may be very humid.

"Harrington's Rule of 100" is commonly used to generalize seed storage conditions. The

rule states that the sum of relative humidity (%) + temperature (F) should not exceed 100 (Harrington, 1960). However, since moisture is the most important factor, the rule stipulates that no more than half the sum should be contributed by the relative humidity. Farmers should aim for storage conditions of less than 35% relative humidity inside sealed containers. Once seeds are in these conditions, they will last for many years depending on the crop type.

Conclusion

Seed harvesting comes down to knowing the differences between wet- and dry-seeded crops, recognizing when seeds are fully mature, and handling them carefully through cleaning, drying, and storage. Wet-seeded crops require extraction and thorough cleaning from fleshy fruit, while dry-seeded crops often need extra time in the field, close monitoring for maturity, and protection from weather, pests, and disease. For both types, success depends on observing maturity indicators, harvesting at the right time, and using simple tools like tarps, screens, mesh bags, or dehumidifiers to dry and clean seed effectively. Larger or shared equipment can make the process more efficient for big harvests, but even basic DIY methods work well for small-scale seed saving.

Once harvested and dried, seeds must be stored in sealed containers to protect the investment of time and resources put into producing them. Seeds can be kept in ambient home or office conditions without refrigeration, but if cold storage is available, placing fully dried seeds in a refrigerator or freezer will extend their viability and quality. The effort needed to dry and store seeds is relatively minimal, affordable, and adaptable to any scale of production. Above all, seed harvesting and storage are skills that improve with practice, observation, and adaptation, making them some of the most rewarding and essential practices for sustainable farming.

REFERENCES

Buttala, Lee and Shanyn Siegel. 2015. The Seed Garden: The Art and Practice of Seed Saving. Seed Savers Exchange.

Dareus, Rocheteau. 2021. Fill it Full: A Simple Way to Reduce Weevil Damage in Maize Seed Stored in Airtight Containers. ECHO Research Notes Volume 2. Available online: edn.link/pdkg62

DeSa, Melissa. 2025a. On Farm Seed Saving: Peppers. https://workingfood.org/resources/savingseeds

DeSa, Melissa. 2025b. On Farm Seed Saving: Tomatoes. https://workingfood.org/resources/savingseeds

DeSa, Melissa. 2025c. On Farm Seed Saving: Winter Squash. https://workingfood.org/resources/savingseeds

ECHO Best Practices Note. 2016. Issue 5: Seed Storage in the Tropics. Seed Storage in the Tropics | ECHOcommunity.org

Harrington, J. F. 1960. Drying, storing, and packaging seed to maintain germination, vigor. Seedman's Digest 11(1): 16 56-57, 64, 66, 68.

McCormack, Jeffrey. 2004. Seed Processing and Storage: Seed Processing and Storage: Principles and practices of seed harvesting, processing, and storage: an organic seed production manual for seed growers in the Mid-Atlantic and Southern U.S. USDA SARE grant. savingourseeds.org/publications.html

Motis, Tim. 2010. Reducing Moisture Content of Seeds Prior to Storage. ECHO Development Notes 109: 1–8. Available online: edn.link/edn109

Motis, Tim. 2019. Vacuum-Sealing Options for Storing Seeds. ECHO Technical Notes. Available online: edn.link/tn93

Navazio, John. 2012. The Organic Seed Grower: A Farmer's Guide to Vegetable Seed Production. Chelsea Green Publishing. Available online: edn.link/77c7951

Osmani, Jena. 2023. Can On-Farm Seed Production Systems in the Southeastern US Supply High Quality Vegetable and Wildflower Seeds? University of Florida Masters Thesis.

Rao, N. K., J. Hanson, M. E. Dulloo, K. Ghosh, A. Nowell, and M. Larinde. 2006. Manual of Seed Handling in Genebanks. Handbooks for Genebanks 8. Available online: hdl.handle.net/10568/2945

Real Seeds. n.d. Open-Source DIY Seed Cleaner Plans. Available online: realseeds.co.uk/seedcleaner.html

AT Ferrell Company. n.d. Clipper Screens. Available online: https://atferrell.com

Further Resources

Videos

Utopian Seed Project: Southeast Seed on YouTube,
https://youtu.be/YBlruoxcjDg?si=rHZ2X6RdU_b37BUW

This video series highlights six Southern crops through interviews with 30 farmers from 12 states, resulting in an eight-episode exploration of seed growing in the Southeast. It serves both as a practical seed saving guide and a deeper look at seed heritage, culture, and ethics.

Websites

ECHO Community, echocommunity.org

A global network that supports small-scale farmers and development workers by sharing practical agricultural knowledge, seeds, and innovative solutions for food security.

Working Food, workingfood.org

Working Food supports growers in developing Florida adapted seeds by providing handson education, mentorship, and shared tools where growers can learn seed selection, harvesting, and storage as part of sustainable production practices.

Organic Seed Alliance, seedalliance.org

Organic Seed Alliance empowers farmers by training them in seed saving and variety selection, supporting farmerled breeding projects, and advocating for policies that protect seed sovereignty and organic seed integrity.

Seed Saving Guide,
seedalliance.org/publications/seed-saving-guide-gardeners-farmers

This guide provides step-by-step instructions to help growers successfully save, select, and steward seeds for long-term agricultural resilience.

Southern Exposure Seed Exchange, southernexposure.com

Southern Exposure supports farmers with regionally adapted, open pollinated seeds and detailed growing advice, enabling growers to choose varieties that are resilient to local pests, diseases, and climate stresses while also supporting seed saving.

The Utopian Seed Project, utopianseed.org

The Utopian Seed Project helps farmers differentiate their crops and access niche markets by promoting unique, flavorful, and culturally significant varieties while connecting growers with chefs, breeders, and seed professionals.This is an older resource so the costs and revenues presented are not current, but there are budget templates included to create your own high tunnel budget.

NOTES

Harvesting, Drying, Processing, and Storing Seed in Hot and Humid Climates

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